

## Equation

It was his day. Despite this, Professor Andreski did not seem like somebody who spreads enthusiasm. Those who knew him well knew him to be a kind of Clint Eastwood character, not easily thrown off his chosen course. He very quickly submitted emotions to cognitive processing. As a rule he joked loudly and willingly engaged in conversation, but he never externalised his positive emotions. The inexorable course of development of such parties, aided by the dependable effect of alcohol, pushed the majority of guests into the embrace of smaller groups, where they gorged on their own unique company, so that the laureate slowly became a decoration to the event.

“What do you think’s wrong with him?”, a charming brunette in a black evening dress asked her partner.

“Andreski?”

“Yes”

“He’s just tired. He’s getting on a bit.”

“Maybe somethings eating him?”

“What?! He’s just collected an award for lifetime achievement, and something should be eating him?”

“Do you think we could liven him up?”

“I doubt it.”

“Want to bet?”

“Sure.”

“Same as usual, a bottle of fine wine?”

“OK.”

“In half an hour he’ll seduce me, and in an hour I’ll have him on the dance floor.”

“Well, let’s see.”

They moved towards the armchair where it seemed Andreski was permanently planted.

“You seem to be comfortably settled here!”- said the girl, planting herself in the armchair opposite and crossing her legs. He partner sat next to her. “Hope we’re not disturbing you?”

“Not in the least! It’s an enormous pleasure that you should join me.”

“What’s troubling you? On a day when you have the most cause for joy, your guests are showing it much more.”

“Well, when we reach a certain age we are more inclined towards reflection than emotions.”

“Would you like to share your reflections with us?”

“I’m not sure you would be interested.”

“Certainly! Please tell ...”

“You mentioned joy, but I’m not completely convinced that there is something to be pleased about. On a personal level, I would certainly say yes. Better to be awarded such a prize than not. But on the other hand, this type of award and the way in which it is celebrated in some way perpetuates the accepted way of making an academic career and shows younger people how to proceed.”

“What’s wrong with that?”

“Well, the fact that it is not a prize for something specific but for so-called scientific output, for life-time achievement and painstaking work, and not for a brilliant solution of some problem. We scientists amass our scientific output in much the same way as a coal miner extracts material, and towards the end of our lives we are awarded for our piles of publications. Often their quality has only secondary significance. Perhaps science should be more like the work of diamond miners? Maybe we should stop paying so much attention to these heaps of insignificant material and instead search diligently for the precious stones among them?”

“And what about those who are unsuccessful?”

“Nothing. The same with painters, writers and poets who have not succeeded, and all those striving to become stars of pop-culture. Does anybody reward them for the sum of their efforts? They enter a game where the chances of winning first prize are slim and the risk of losing is high. This is clear to everyone, that’s why nobody rewards them solely for entering the game a few dozen times.”

“What you say is rather bitter, even cruel.”

“Cruel to whom? Are we not now cruel to those who are able to find diamonds among enormous heaps of useless material? At least please look at the Nobel prizes awarded in our field. The majority of them are awarded years after the discoveries themselves. Many of the laureates were so old they didn’t even get the chance to enjoy it. When I was younger and my health allowed it, I climbed. Sometimes the path took many hours of laborious and exhausting mountaineering. We even sometimes spent the night pinned to the rock face. When, with difficulty, we eventually reached our goal, drove in

pitons and set up camp, it happened that some bird flew close to us. He settled for a moment and then flew off only he knew where. Hadn't he achieved the same as us, but in a completely different way? But we reward only the alpine way and perpetuate the conviction that only this classic technique counts."

"If we started copying the birds no doubt we would soon be extinct", commented the girl in a clumsy attempt at developing the professor's metaphor.

"If we hadn't copied them, we wouldn't be flying in planes and conquering the cosmos. Please don't misunderstand me. Sometimes a whole army of workers has to dig through barren strata to come across something worthy of attention, but in recognizing this work we have lost moderation. Rather we should take the advice of Buddha to our hearts – "Act always as if the future of the universe depended on what you did, while laughing at yourself for thinking that whatever you do makes any difference"."

"And that's what you expect from yourself? Can anybody normal afford such a distance to their work? After all, you're not Buddha!"

"It's true that I'm a long way from it, but I think I met it once." The man and the girl exchanged significant glances.

"How's that possible?", the girl asked courteously.

"It's quite a long and very far-flung story."

"If you're not in any hurry, we'll be happy to listen."

"It happened at the beginning of my career. At that time it seemed to us that we would soon solve the rest of the problems which the previous generation of physicists had failed to disentangle. And once we had done that we would start formulating great consolidating theories. Belief in our own talents and intellectual possibilities left no obstacles to our imagination. If we fretted about something, it was only about whether others were overtaking us. There were so many like us in the world, just as talented and impatient to reach for the laurels of discovery, that fear of competition and the illusion of participating in an imaginary race added to that self-certainty characteristic of impetuous youth. The stories of the best of our predecessors also urged us on. Most of them had made their discoveries before they were thirty.

Everything was in our favour. The very fact of engaging in physics – the most advanced science – placed us in the scientific elite. That we were working in one of the most elite institutes in the country suffused us, though never generously, with an additional dispassionate pride. Standing at the beginning of our careers, we already felt like those who had won something in their lives. It could only get better. We almost flew through the air just thinking about the future."

The professor took a sip from his glass and thought for a while, as though studiously examining the past.

“I was one of them. The spring of 1966 gave me an additional energy, suffusing every tissue of my body and maintaining my brain in ceaseless euphoria. At that time I was taking part in seminars at the Institute of Physics at the University of Warsaw, although I was actually working at the Polish Academy of Science, where I was researching for my PhD. I was mainly involved with hydrodynamics. Then Professor Rosenfeld himself invited me to deliver the Thursday discussion sessions. That was really something! My subject was to be the application of the classical field theory to the theory of turbulence, which was popular at the time, with the then fashionable Feynman diagrams. Even now it is still one of the most difficult problems in classical physics based on the Navier-Stokes equations. The lecture was evidently successful, because Rosenfeld proposed that after completing my PhD I should go to work with him at the institute, and by the way asked me to take a look at some work on Navier-Stokes equations which had actually been sent to his secretariat. He received dozens of such “works”. In truth, Rosenfeld ordered rather than proposed, but for a young assistant lecturer it was like the smile of God. I received a thick grey briefcase stuffed with papers, and so it began.”

Here the professor again paused for thought.

“Another visionary who had seen the light?” speculated the girl.

“Not entirely. The truth was that this dissertation bore all the hallmarks of the work of someone senselessly breaking all known truths. There’s no lack of them in physics. However, I soon noticed that in this case it was somewhat different. The author wrote that when he was in a provincial city in the east of Poland he came across a hydrodynamic handbook by Lev Landau and Evgeny Lifshitz. It was a volume constituting one of the most important (one could say almost cult) series of handbooks in physics. It was not only surprising that by some miracle he had come across such a handbook in his city, but also that he had actually read it!

In it he found the Navier-Stokes equations, and unceremoniously started to solve one of the problems connected with them. They describe the principle of the behaviour of mass and momentum in a moving fluid. Their solution would make it possible to deal with numerous calculative problems, from describing the flow of air around the wings of an aeroplane to calculations connected with the impact of tsunamis. It has even been attempted to calculate the spread of fires with their help. In their general form these equations are so complicated and difficult that when they were formulated nobody was able to use them in practice. At that time physicists limited themselves solely to describing a few very simple hydrodynamic systems, because the manual solution of the appropriate equations was simply not possible. Even today, with the most up to date and powerful computers, this model can only be used with severe limitations. It’s clear that the Navier-

Stokes equation works, but there is still no evidence that it proves itself in every situation, so that it's not known if its use in specific calculations does not give false results. In 2000 the Clay Mathematics Institute stated that the Navier-Stokes equations were one of the seven Millennium Prize Problems, and offered a prize of one million dollars for their correct solution. It is true that in 2004 it was announced that Mukhtarbay Otelbayev of the Eurasian National University in Kazakhstan, having tackled the problem for 30 years, had provided the evidence, but when his work was translated from Russian to English and rigorously checked, a minor error was found on page 56 which wrecked the whole process of his reasoning. So the problem is still unsolved, and a million dollars awaits the genius who can do it. It is said of these equations that every mathematician tackling them for any length of time once had a glimmer that he had solved them, but usually woke the next morning sober."

"Did that man throw himself into the problem?"

"In a sense, yes. However, despite all his nonchalance, he didn't throw himself into finding evidence of the propriety of those equations, but sought a solution to only one of the problems connected with them, namely the flow of fluids through a conical funnel. From what he had written about himself it turned out that he had finished his school education but never went on to study anything. He carried out his solution by using the most backbreaking method. It was an analytical solution, simply speaking a symbolic model and not a table of figures. Nowadays such tasks are almost exclusively solved numerically. Algorithms are very fast, and there is nothing cognitive in these problems. They are solved when they are needed for engineering application, but the Navier-Stokes equations still constitute a headache in the theory of turbulence and there are still fundamental problems with them. But surprise! – the solution which he sent was correct. There were some unnecessary calculations and conversions, but no errors. It was evident in the way that man came to his solution that he had learnt some exceptionally difficult things, and he overcame the obstacle of his lack of education through painstaking work and unusual adroitness."

"Did you tell anybody about this?"

"Yes. I was working in the Institute of Material Sciences and Applied Mechanics at the Polish Academy of Science, and when my boss and colleagues found out about this they were amazed that such a solution had actually been found. I went to Rosenfeld and told him the whole story, and that my colleagues at the institute had cleaned up the solution and wanted to work with its author. He reacted in his own characteristic manner, saying "Write to that man, tell him to come to Warsaw and I will arrange studies for him." So I did that. I wrote a very polite letter. After a few weeks I received a reply. Its author thanked me for the proposition but at the same time declined it. He said in his letter that now he was occupied with something completely different and had no intention of studying."

The professor remained silent for a while. So did his listeners.

“Can you imagine that? He abandoned the rock face on which so many people had climbed with enormous difficulty without reaching the heights that he had. He abandoned it like a bird who had settled there for a moment, like a man abandons a lover who is the object of the sighs of a thousand men, like a butterfly abandons a beautiful flower.”

“What happened then?”

“Nothing. I wrote him several more letters but he never replied. During many office removals I mislaid my correspondence with him. Because I have nowhere to store everything, I gave all my documentation to an archive – letters, manuscripts and a whole lot of other papers – and don’t even have the means to search for traces of those events anywhere, except in my mind. Anyway, why would I want to? Two of my colleagues from the institute who also contacted him are no longer alive. That’s all.”

The banqueting hall slowly emptied. Andreski rose from his armchair in the way characteristic of those whose spine has been giving them trouble for some time. He supported his still impressive figure on his walking stick.

“Time for me to go. Good night.”

“Good night.”

“You lost”, muttered the man.

“Yes”, she replied thoughtfully, following the disappearing figure of the professor.